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A FORTRAN FOR SOLVING SYSTEMS OF COUPLED SECOND-ORDER DIFFERENT--ETC(U)
AUG 76 J M FORBES, H B GARRETT F19628-76-C-0059
UNCLASSIFIED BC-SDAL-77-1 AFGL-TR-76-0205 NL

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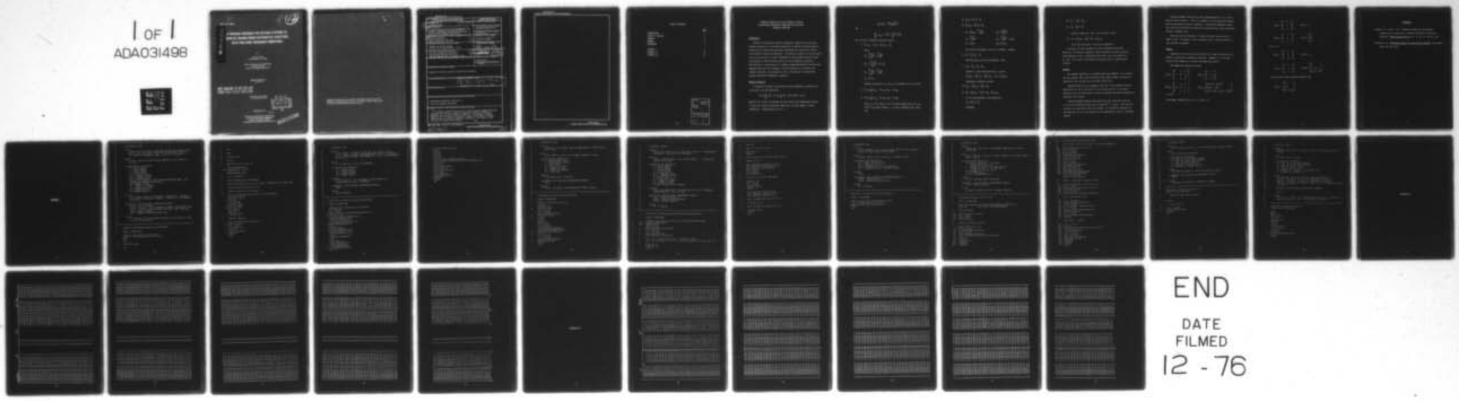

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A FORTRAN PROGRAM FOR SOLVING SYSTEMS OF COUPLED SECOND-ORDER DIFFERENTIAL EQUATIONS WITH TWO-POINT BOUNDARY CONDITIONS

By

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Scientific Report No. 1
1 August 1976

Approved for public release;
Distribution Unlimited

PREPARED FOR

AIR FORCE GEOPHYSICS LABORATORY
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
HANSCOM AFB, MASSACHUSETTS 01731

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE 19		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER 18 AFGL-TR-76-0205	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) 6 A FORTRAN PROGRAM FOR SOLVING SYSTEMS OF COUPLED SECOND-ORDER DIFFERENTIAL EQUATIONS WITH TWO-POINT BOUNDARY CONDITIONS		5. TYPE OF REPORT & PERIOD COVERED Scientific Report No. 1
		6. PERFORMING ORG. REPORT NUMBER BC SDAL-77-1
7. AUTHOR(s) 10 Jeffrey M. Forbes, Henry B. Garrett ~~1ST, USAF~~	15	8. CONTRACT OR GRANT NUMBER(s) F19628-76-C-0059 new
9. PERFORMING ORGANIZATION NAME AND ADDRESS Trustees of Boston College, Chestnut Hill, Massachusetts 02167		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 62101F 669003 427M0001
11. CONTROLLING OFFICE NAME AND ADDRESS Air Force Geophysics Laboratory, Hanscom AFB, Massachusetts 01731, Contract Monitor, Ms. D. Gillette (LKB)	11	12. REPORT DATE 1 August 1976 12 35p.
		13. NUMBER OF PAGES 32
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; Distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

14 BC-SDAL-77-1, Scientific-1

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Differential Equations, Solution of

Two-Point Boundary Conditions

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A computer program suitable for use on the CDC 6600 computer has been developed that solves a system of second-order ordinary differential equations with two-point boundary conditions. The program is highly adaptable and can readily be altered to solve a wide variety of second-order partial or ordinary differential equations. The method is that outlined in Lindzen and Kuo (1969).

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TABLE OF CONTENTS

A FORTRAN PROGRAM FOR SOLVING SYSTEMS OF COUPLED SECOND-ORDER DIFFERENTIAL EQUATIONS WITH TWO-POINT BOUNDARY CONDITIONS

INTRODUCTION

Systems of second-order ordinary differential equations with two-point boundary conditions are invariably encountered in problems of applied physics. Lindzen and Kuo (1969) have published an algorithm for solving such systems by the method of Gaussian Elimination. The method was found to be of particular value in the solution of various thermospheric tidal problems currently under investigation at Boston College and the Air Force Geophysics Laboratory. The following is a description of a computer program developed for the CDC 6600 computer which uses this technique. With the addition of a suitable user-supplied subroutine, the program can solve a wide variety of second-order ordinary and partial differential equations.

METHOD OF SOLUTION

A system of N coupled, second-order ordinary differential equations can be written in the following form:

$$\bar{\bar{C}}'(x)\,\frac{d^2}{dx^2}\,\bar{F}(x) + \bar{\bar{A}}'(x)\,\frac{d}{dx}\,\bar{F}(x) + \bar{\bar{B}}'(x)\,\bar{F}(x) = \bar{R}'(x)$$

Where $\bar{\bar{A}}'$, $\bar{\bar{B}}'$, and $\bar{\bar{C}}'$ are NxN matrices and $\bar{F}$ and $\bar{R}'$ are N-dimensional vectors. To solve this system of equations numerically, we first change to finite differences. Letting $x_n = n\delta x$ $(n=1,2,\ldots)$:

$$\frac{d}{dx} F(x_n) \simeq \frac{F_{n+1} - F_{n-1}}{2\ \delta x}$$

and

$$\frac{d^2}{dx^2} F(x_n) \simeq \frac{F_{n+1} - 2\ F_n + F_{n-1}}{\delta x^2}$$

the new finite difference equations become:

1) $\bar{\bar{A}}_n\ \bar{F}_{n-1} + \bar{\bar{B}}_n\ \bar{F}_n + \bar{\bar{C}}_n\ \bar{F}_{n+1} = \bar{\bar{R}}_n$

where

$$\bar{\bar{A}}_n = \frac{\bar{\bar{C}}'(x_n)}{(\delta x)^2} - \frac{\bar{\bar{A}}'(x_n)}{2\ \delta x}$$

$$\bar{\bar{B}}_n = \frac{-2\ \bar{\bar{C}}'(x_n)}{(\delta x)^2} + \bar{\bar{B}}'(x_n)$$

$$\bar{\bar{C}}_n = \frac{\bar{\bar{C}}'(x_n)}{(\delta x)^2} + \frac{\bar{\bar{A}}'(x_n)}{2\ \delta x}$$

$$\bar{\bar{R}}_n = \bar{R}'(x_n)$$

Boundary conditions at x_1 and x_N are assumed to be of the form:

2) $\bar{\bar{C}}'(x_1)\ \frac{d}{dx} \bar{F}\Big|_{x_1} + \bar{\bar{A}}'(x_1)\ \bar{F}(x_1) = \bar{R}'(x_1)$

3) $\bar{\bar{C}}'(x_N)\ \frac{d}{dx} \bar{F}\Big|_{x_N} + \bar{\bar{A}}'(x_N)\ \bar{F}(x_N) = \bar{R}'(x_N)$

where x_1 is the value of x at the lower boundary and x_N is the value at the upper boundary. In finite difference form, these are:

4) $\bar{\bar{A}}_1 \bar{F}_1 + \bar{\bar{B}}_1 \bar{F}_2 = \bar{R}_1$

5) $\bar{\bar{A}}_N \bar{F}_{N-1} + \bar{\bar{B}}_N \bar{F}_N = \bar{R}_N$

$$\bar{\bar{A}}_1 = \bar{\bar{A}}'(x_1) - \frac{\bar{\bar{C}}'(x_1)}{\delta x} \qquad \bar{\bar{A}}_N = \frac{-\bar{\bar{C}}'(x_N)}{\delta x}$$

$$B_1 = \frac{\bar{\bar{C}}'(x_1)}{\delta x} \qquad B_N = \frac{\bar{\bar{C}}'(x_N)}{\delta x} + A'(x_N)$$

$$\bar{R}_1 = \bar{R}'(x_1) \qquad \bar{R}_N = \bar{R}'(x_N)$$

The solution (Richtmyer, 1957) is as follows. Assume:

6) $\bar{F}_n = \bar{\bar{\alpha}}_n \bar{F}_{n+1} + \bar{\beta}_n$

where $\bar{\bar{\alpha}}_n$ and $\bar{\beta}_n$ are to be determined. Then:

7) $\bar{F}_{n-1} = \bar{\bar{\alpha}}_{n-1} \bar{F}_n + \bar{\beta}_{n-1}$

Equation 7, when substituted into 1, yields:

$$(\bar{\bar{A}}_n \bar{\bar{\alpha}}_{n-1} + \bar{\bar{B}}_n) \bar{F}_n + (\bar{\bar{C}}_n) \bar{F}_{n+1} = (\bar{R}_n - \bar{\bar{A}}_n \bar{\beta}_{n-1})$$

Comparing to Equation 6 yields:

8) $\bar{\bar{\alpha}}_n = -(\bar{\bar{A}}_n \bar{\bar{\alpha}}_{n-1} + \bar{\bar{B}}_n)^{-1} \bar{\bar{C}}_n$

9) $\bar{\beta}_n = (\bar{\bar{A}}_n \bar{\bar{\alpha}}_{n-1} + \bar{\bar{B}}_n)^{-1} (\bar{R}_n - \bar{\bar{A}}_n \bar{\beta}_{n-1})$

At the lower boundary, using Equation 6:

$$\bar{F}_1 = \bar{\bar{\alpha}}_1 \bar{F}_2 + \bar{\beta}_1$$

Therefore:

10) $\bar{\bar{\alpha}}_1 = -(\bar{\bar{A}}_1)^{-1} \bar{\bar{B}}_1$

11) $\bar{\beta}_1 = (\bar{\bar{A}}_1)^{-1} \bar{R}_1$

Likewise, Equations 5 and 7 can be solved to give:

12) $F_N = (\bar{\bar{A}}_N \bar{\bar{\alpha}}_{N-1} + \bar{\bar{B}}_N)^{-1}(\bar{R}_N - \bar{\bar{A}}_N \bar{\beta}_{N-1})$

We now have the means of solving the equations.

To review, we first calculate the finite difference form of the equations. $\bar{\bar{\alpha}}_1$ and $\bar{\beta}_1$ are computed. Then we generate the other $\bar{\bar{\alpha}}_n$ and $\bar{\beta}_n$, using Equations 8 and 9, through $\bar{\bar{\alpha}}_n$ and $\bar{\beta}_N$ (note: $\bar{\bar{\alpha}}_N$ is not needed and $\bar{F}_N = \bar{\beta}_N$). The α and $\bar{\beta}$, with Equation 6, generate the $\bar{F}_n$, completing the solution.

PROGRAM

The computer formulation is straightforward (see Appendix I for listing). The main program, TIDE, calls subroutines ABCR, ABCRN, ALPBET, and SOL which perform the steps outlined in the previous description.

Subroutine ABCR is to be supplied by the user. This program calculates matrices $\bar{\bar{A}}'$, $\bar{\bar{B}}'$, and $\bar{\bar{C}}'$ and vector $\bar{R}'$ for a given value of x. By proper manipulation of this subroutine, a variety of ordinary and partial differential equations can be solved.

Subroutine ABCRN calculates the matrices $\bar{\bar{A}}_n$, $\bar{\bar{B}}_n$, and $\bar{\bar{C}}_n$ and vector $\bar{R}_n$ in the finite difference forms given in Equations 1, 4, and 5. Note that the matrices A, B, and C and vector R are reused. As the typical dimensions of such matrices are 40 x 40 or greater for our applications, this is a necessary process.

Subroutine ALPBET calculates $\bar{\bar{\alpha}}_n$ and $\bar{\beta}_n$ from Equations 8, 9, 10, and 11. They are stored on TAPE 4. TAPE 3 is necessary as a work tape for otherwise twice as many matrices would be required. If the matrix dimensions permit, this tape could be deleted and replaced by storage matrices, with substantial savings in computer time.

Subroutine SOL uses Equation 7 to obtain the final solutions which appear in FNC. The output, in FNC, is printed, but it could be stored on a tape, plotted, or punched.

EXAMPLE

Appendices II and III contain the results of a sample calculation for 3 ordinary, second-order differential equations. Appendix II is the exact solution while Appendix III contains the numerical solution.

The example was defined as follows:

$$\bar{\bar{A}}'(x) = \begin{vmatrix} 0 & 0 & i\ x^3 \\ 0 & x^2 & 0 \\ 0 & 0 & x^2 \end{vmatrix} \qquad \bar{\bar{B}}'(x) = \begin{vmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & x^2 \end{vmatrix}$$

$$\bar{\bar{C}}'(x) = \begin{vmatrix} 2 & 0 & 0 \\ i\ x^3 & x^2 & 0 \\ 0 & 0 & 0 \end{vmatrix} \qquad \bar{R}'(x) = \begin{vmatrix} (4-3\ x^3) + i(4\ x^6) \\ i(8\ x^3 + 3\ x^4) \\ (4\ x^5 + x^6) + (3\ x^2 + 3\ x^3)i \end{vmatrix}$$

$i = \sqrt{-1}$

The boundary conditions are, for x = 0 and x = T:

$$\bar{\bar{A}}'(0) = \begin{vmatrix} 0 & 0 & 0 \\ 0 & 0 & 2 \\ 0 & 3 & 0 \end{vmatrix} \qquad \bar{\bar{B}}'(0) = 0$$

$$\bar{\bar{C}}'(0) = \begin{vmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{vmatrix} \qquad \bar{R}'(0) = \begin{vmatrix} 0 \\ 3i \\ 0 \end{vmatrix}$$

For x = T:

$$\bar{\bar{A}}'(T) = \begin{vmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & T^2 & 0 \end{vmatrix} \qquad \bar{\bar{B}}'(T) = 0$$

$$\bar{\bar{C}}'(T) = \begin{vmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 2 & 0 \end{vmatrix} \qquad \bar{R}'(T) = \begin{vmatrix} T^2 \\ T^4 + 3\,T\,i \\ i(6\,T^2 + T^5) \end{vmatrix}$$

The solutions to this system of equations are:

$$\bar{F}(x) = \begin{vmatrix} x^2 \\ i\,x^3 \\ x^4 + (3\,x)i \end{vmatrix}$$

REFERENCES

Lindzen, R.S., and H.L. Kuo, "A Numerical Method for the Numerical Integration of a Large Class of Ordinary and Partial Differential Equations", Monthly Weather Review, Vol. 97, No. 10, 732-734, 1969.

Richtmyer, R.D., Difference Methods for Initial-Value Problems, Interscience Press, New York, 1957.

APPENDIX I

```
C         MAIN PROGRAM TIDE
C
C         PURPOSE
C              NUMERICALLY INTEGRATES EQUATION C(D2/DX2)F+A(D/DX)F+BF=R.
C              WHERE A,B,C ARE MATRICES AND F,R ARE VECTORS. A,B,C,R
C              ARE GIVEN BY SUBROUTINE ABCR.  F IS TO BE COMPUTED
C
C         USAGE
C              PROVIDE INPUT SUBROUTINE ABCR. OUTPUT AT STATEMENTS 10
C              AND 11.
C
C         DESCRIPTION OF PARAMETERS
C              A - INPUT MATRIX
C              B - INPUT MATRIX
C              C - INPUT MATRIX
C              R - INPUT VECTOR
C              BET - STORAGE VECTOR
C              FNC1 - STORAGE VECTOR
C              FNC - OUTPUT VECTOR
C              DETERM - DETERMINANT VALUE FROM MATRIX INVERSION.  ILL-
C              CONDITIONED PROBLEM WILL GIVE 0.
C              IR - NUMBER OF ROWS
C              IC - NUMBER OF COLUMNS
C              S1 - INITIAL VALUE OF X
C              SN - FINAL VALUE OF X
C              N - NUMBER OF STEPS
C
C         REMARKS
C              USER SHOULD CHANGE DIMENSIONS AS APPROPRIATE.  IN THIS
C              CASE WHERE THE NUMBER 3 APPEARS.  OUTPUT IS AT STATEMENTS
C              10 AND 11.
C
C         SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
C              ABCR - SETS UP PROBLEM
C              ABCRN - CONVERTS USER'S PROBLEM TO FINITE DIFFERENCE FORM.
C              ALPBET - COMPUTES INTERMEDIATE SOLUTIONS ALPHA AND BETA
C              CABS - SYSTEM FUNCTION
C              SOL - COMPUTES FINAL SOLUTIONS F(X)
C
C         METHOD
C              SEE LINDZEN AND KUO, MONTHLY WEATHER REVIEW, VOL. 97, NO.
C              10, OCT 1969,732-734.
C
C.......................................................................
C
      PROGRAM TIDE(INPUT,OUTPUT,TAPE3=513,TAPE4)
C
C     CHANGE DIMENSIONS
C
      COMPLEX A(3,3),B(3,3),C(3,3),R(3)
      COMPLEX BET(3),FNC(3),FNC1(3),DETERM
      IR=3
      IC=3
C
C     INTEGRATE FROM:
C
      S1=0
```

```
C
C     TO:
C
      SN=2
C
C     IN STEPS OF:
C
      DX=.01
C
C     NUMBER OF STEPS WILL BE:
C
      N=(SN-S1)/DX+1.001
  100 FORMAT(6(1X, E13.6))
      DO 7 I=1,N
      X=DX*FLOAT(I-1)+S1
C
C     SET UP MATRICES
C
      CALL ABCR(A,B,C,R,I,N,X,IR,IC)
C
C     COMPUTE MATRICES A,B,C AND VECTOR R IN FINITE DIFFERENCE FORM
C
      CALL ABCRN(A,B,C,I,N,IR,IC,DX)
C
C     COMPUTE ALPHA AND BETA MATRICES
C
      CALL ALPBET(A,B,C,R,BET,FNC1,I,N,IR,IC,DETERM)
      DET=CABS(DETERM)
      IF(DET) 7,99,7
    7 CONTINUE
      DO 4 I=1,IR
      FNC(I)=BET(I)
    4 FNC1(I)=BET(I)
   10 PRINT 100,FNC
      DO 5 I=2,N
      BACKSPACE 4
      BACKSPACE 4
      READ(4) A,BET
C
C     COMPUTE FUNCTION
C
      CALL SOL(A,BET,FNC,FNC1,IR,IC)
   11 PRINT 100,FNC
    6 DO 5 J=1,IR
    5 FNC1(J)=FNC(J)
      GO TO 97
   99 PRINT 100,DETERM
   97 CONTINUE
      STOP
      END
```

```
C          SUBROUTINE ABCR
C
C          PURPOSE
C              USER-PROVIDED SUBROUTINE THAT SETS UP EQUATIONS TO BE
C              SOLVED. LOWER BOUNDARY CONDITIONS ARE GIVEN IN STATEMENT 10
C              TO 11, UPPER BOUNDARY CONDITIONS IN 4 TO 12, AND EQUATIONS
C              IN 5 TO 6.
C
C          USAGE
C              SET UP MATRICES A,B,C AND VECTOR R.
C
C          DESCRIPTION OF PARAMETERS
C              A1 - OUTPUT MATRIX
C              B1 - OUTPUT MATRIX
C              C1 - OUTPUT MATRIX
C              R1 - OUTPUT VECTOR
C
C          REMARKS
C              USER-PROVIDED.  THE SOLUTION TO THIS EXAMPLE IS:
C              F(X)=(X**2,I*(X**3),X**4+3*X*I)
C
C          SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
C              NONE
C
C          METHOD
C              USER SUPPLIED
C
C.......................................................................
C
      SUBROUTINE ABCR(A1,B1,C1,R1,K,N,X,IR,IC)
C
C     CHANGE DIMENSIONS
C
      COMPLEX A1(3,3),B1(3,3),C1(3,3),R1(3)
      DO 1 I=1,IR
      DO 1 J=1,IC
    1 A1(I,J)=B1(I,J)=C1(I,J)=CMPLX(0.0,0.0)
   10 IF(K-1) 2,2,3
    2 C1(1,1)=C1(2,3)=CMPLX(1.,0.0)
      A1(2,3)=CMPLX(2.,0.0)
      A1(3,2)=CMPLX(3.,0.0)
      R1(1)=R1(3)=CMPLX(0.0,0.0)
   11 R1(2)=CMPLX(0.0,3.0)
      GO TO 6
    3 IF(K-N) 5,4,4
    4 A1(1,1)=CMPLX(1.,0.0)
      C1(3,2)=CMPLX(2.,0.0)
      A1(2,3)=CMPLX(1.,0.0)
      A=X*X
      A1(3,2)=CMPLX(A,0.0)
      B=A*A
      BI=3.*X
      CI=6.*X*X+A*A*X
      R1(1)=CMPLX(A,0.0)
      R1(2)=CMPLX(B,BI)
   12 R1(3)=CMPLX(0.0,CI)
      GO TO 6
```

```
5  C1(1,1)=CMPLX(2.0,0.0)
   T1=X*X
   T2=X*T1
   T3=T2*X
   T4=T3*X
   T5=T4*X
   C1(2,1)=A1(1,3)=CMPLX(0.0,T2)
   C1(2,2)=A1(2,2)=A1(3,3)=B1(3,3)=CMPLX(T1,0.0)
   R=4.-3.*T2
   RI=4.*T5
   F1(1)=CMPLX(R,RI)
   RI=6.*T2+3.*T3
   F1(2)=CMPLX(0.0,RI)
   R=4.*T4+T5
   RI=3.*T1+3.*T2
   F1(3)=CMPLX(R,RI)
6  CONTINUE
   RETURN
   END
```

```
C          SUBROUTINE ABCRN
C
C          PURPOSE
C              CONVERTS DIFFERENTIAL FORM OF EQUATIONS TO FINITE DIFFER-
C              ENCE FORM.
C
C          USAGE
C              INPUT MATRICES A,B,C AND X VALUE. OUTPUT IN A,B,C.
C
C          DESCRIPTION OF PARAMETERS
C              A - INPUT,OUTPUT MATRIX
C              B - INPUT,OUTPUT MATRIX
C              K - STEP NUMBER
C              N - FINAL STEP NUMBER
C              IR - NUMBER OF ROWS
C              IC - NUMBER OF COLUMNS
C              DX - STEP SIZE
C
C          REMARKS
C              DIMENSIONS MUST BE CHANGED
C
C          SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
C              NONE
C
C          METHOD
C              FINITE DIFFERENCE APPROXIMATION TO DIFFERENTIAL.
C
C.......................................................................
C
      SUBROUTINE ABCRN(A,B,C,K,N,IR,IC,DX)
C
C     CHANGE DIMENSIONS
C
      COMPLEX A(3,3),B(3,3),C(3,3)
      F=1./DX
      IF(K-1) 1,1,2
2     IF(K-N) 3,8,8
1     DO 10 I=1,IR
      DO 10 J=1,IC
      A(I,J)=A(I,J)-F*C(I,J)
10    B(I,J)=F*C(I,J)
      GO TO 6
3     F2=F*F
      F3=F/2.
      F4=-2.*F2
      DO 20 I=1,IR
      DO 20 J=1,IC
      B(I,J)=B(I,J)+F4*C(I,J)
      C(I,J)=F2*C(I,J)+F3*A(I,J)
20    A(I,J)=C(I,J)-F*A(I,J)
      GO TO 6
8     DO 30 I=1,IR
      DO 30 J=1,IC
      B(I,J)=A(I,J)+F*C(I,J)
30    A(I,J)=-F*C(I,J)
6     RETURN
      END
```

```
C         SUBROUTINE ALPBET
C
C         PURPOSE
C            CALCULATES ALPHA AND BETA WHICH ARE NEEDED AS INTERMEDIATE
C            SOLUTIONS.  OUTPUT APPEARS ON TAPE4.
C
C         USAGE
C            PROVIDE INPUT MATRICES A,B,C AND VECTOR D.  RETURN ALPHA
C            AND BETA ON TAPE4.
C
C         DESCRIPTION OF PARAMETERS
C            A - INPUT MATRIX
C            B - INPUT MATRIX
C            C - INPUT MATRIX
C            D - INPUT VECTOR
C            BET - WORKING VECTOR
C            FNC1 - WORKING VECTOR
C            K - STEP NUMBER
C            N - FINAL STEP NUMBER
C            IR - NUMBER OF ROWS
C            IC - NUMBER COLUMNS
C            DETERM - VALUE OF DETERMINANT
C
C         REMARKS
C            TAPE3 IS A WORK TAPE.  IN MANY CASES IT CAN BE REPLACED
C            WITH MATRICES TO CUT RUN TIME
C
C         SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
C            MINV - MATRIX INVERSION
C            MPRDD - MATRIX MULTIPLICATION
C            GMADD - MATRIX ADDITION
C
C         METHOD
C            SEE REFERENCE
C
C..................................................................
C
      SUBROUTINE ALPBET(A,B,C,D,BET,FNC1,K,N,IR,IC,DETERM)
C
C     CHANGE DIMENSIONS
C
      COMPLEX A(3,3),B(3,3),C(3,3),D(3),BET(3),FNC1(3),DETERM
100   FORMAT(6(1X,E13.6))
101   FORMAT(1X,I4)
      IF(K-1) 1,1,2
1     CALL MINV(A,IC,D,1,DETERM)
      DO 11 KI=1,IR
      DO 11 JI=1,IC
11    A(KI,JI)=-A(KI,JI)
      CALL MPRDD(A,B,C,IR,IC,IC)
C
C     WRITE ALPHA ZERO AND BETA ZERO ON TAPES 3 AND 4
C     TAPE3 IS A WORKING TAPE. TAPE4 STORES ALL ALPHA N'S AND BETA N'S
C
      WRITE(3) C,D
      WRITE(4) C,D
      RETURN
```

```
2     CONTINUE
C
C     STORE CN AND BN ON TAPE3
C
      WRITE(3) C,B
      REWIND 3
C
C     READ AL(N-1) AND BET(N-1) FROM TAPE3
C
      READ(3) C,BET
C
      CALL MPRDD(A,BET,FNC1,IR,IC,1)
      CALL GMADD(D,FNC1,BET,IR,1,-1.)
      CALL MPRDD(A,C,B,IR,IC,IC)
      DO 4 I=1,IR
      DO 4 J=1,IC
4     A(I,J)=B(I,J)
C
C     RETRIEVE CN AND BN FROM TAPE3
C
      READ(3) C,B
      DO 5 I=1,IR
      DO 5 J=1,IC
5     C(I,J)=-C(I,J)
      REWIND 3
C
      CALL GMADD(B,A,B,IR,IC,1.)
      CALL MINV(B,IC,BET,1,DETERM)
      CALL MPRDD(B,C,A,IR,IC,IC)
C
C     WRITE BET(N) AND AL(N) ON TAPE3
C
      WRITE(3) A,BET
C
C     WRITE BET(N) AND AL(N) ON TAPE4
C
      WRITE(4) A,BET
      RETURN
      END
```

```
C         SUBROUTINE SOL
C
C         PURPOSE
C              GIVEN INTERMEDIATE SOLUTIONS ALPHA AND BETA AND PREVIOUS
C              VALUE OF F(X), SOLVES FOR F(X-DX).
C
C         USAGE
C              PROVIDE ALPHA, BETA, AND F(X).  RETURNS F(X-DX).
C
C         DESCRIPTION OF PARAMETERS
C              ALP - INPUT MATRIX ALPHA
C              BET - INPUT VECTOR BETA
C              FNC1 - PREVIOUS VECTOR SOLUTION F(X)
C              FNC - RETURNED VECTOR SOLUTION F(X-DX)
C
C         REMARKS
C              NONE
C
C         SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
C              GMADD - MATRIX ADDITION
C              MPRDD - MATRIX MULTIPLICATION
C
C         METHOD
C              SEE REFERENCE.
C
C.......................................................................
C
      SUBROUTINE SOL(ALP,BET,FNC,FNC1,IR,IC)
C
C     CHANGE DIMENSIONS
C
      COMPLEX ALP(3,3),BET(3),FNC(3),FNC1(3)
      CALL MPRDD(ALP,FNC1,FNC,IR,IC,1)
      CALL GMADD(FNC,BET,FNC,IR,1,1.)
      RETURN
      END
```

```
C          SUBROUTINE MINV
C
C          PURPOSE
C               MATRIX INVERSION WITH ACCOMPANING SOLUTIONS OF LINEAR
C               EQUATIONS.
C
C          USAGE
C               INPUT MATRICES A AND B. RETURNS A-INVERSE IN A AND A-INVERSE
C               TIMES B IN B.
C
C          DESCRIPTION OF PARAMETERS
C               A - INPUT MATRIX TO BE INVERTED
C                   INVERSE RETURNED IN A.
C               B - MATRIX OR VECTOR SUCH THAT AX*B=B.
C                   A-INVERSE TIMES B RETURNED IN B.
C               N - COLUMNS IN A, ROWS IN B.
C               M - COLUMNS IN B.
C               DETERM - DETERMINANT OF A
C
C          REMARKS
C               F1 NBSB MATINV MATRIX INVERSION
C
C          SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
C               CABS - SYSTEM FUNCTION
C
C          METHOD
C               GAUSSIAN ELIMINATION WITH PARTIAL PIVOTING.
C
C.......................................................................
C
      SUBROUTINE MINV(A,N,B,M,DETERM)
C
C     CHANGE DIMENSIONS
C
      DIMENSION A(3,3),B(3,1),PIVOT(3),IPIVOT(3),INDEX(3,2)
      COMPLEX           A,B,DETERM,PIVOT,AMAX,SWAP,T
C
C     INITIALIZATION
C
 10   DETERM= CMPLX (1.0,0.0)
 15   DO 20 J=1,N
 20   IPIVOT(J)=0
 30   DO 550 I=1,N
C
C     SEARCH FOR PIVOT ELEMENT
C
   40 AMAX= CMPLX (0.0,0.0)
 45   DO 105 J=1,N
 50   IF(IPIVOT(J)-1)60,105,60
 60   DO 100 K=1,N
 70   IF(IPIVOT(K)-1)80,100,740
 80   IF(CABS(AMAX)-CABS(A(J,K)))85,100,100
 85   IROW=J
 90   ICOLUM=K
 95   AMAX=A(J,K)
100   CONTINUE
105   CONTINUE
```

```
110    IPIVOT(ICOLUM)=IPIVOT(ICOLUM)+1
C
C      INTERCHANGE ROWS TO PUT PIVOT ELEMENT ON DIAGONAL
C
130    IF(IROW-ICOLUM) 140,260,140
140    DETERM=-DETERM
150    DO 200 L=1,N
160    SWAP=A(IROW,L)
170    A(IROW,L)=A(ICOLUM,L)
200    A(ICOLUM,L)=SWAP
205    IF(M)260,260,210
210    DO 250 L=1,M
220    SWAP=B(IROW,L)
230    B(IROW,L)=B(ICOLUM,L)
250    B(ICOLUM,L)=SWAP
260    INDEX(I,1)=IROW
270    INDEX(I,2)=ICOLUM
310    PIVOT(I)=A(ICOLUM,ICOLUM)
320    DETERM=DETERM*PIVOT(I)
       DET=CABS(DETERM)
       IF(DET    )330,740,330
C
C      DIVIDE PIVOT ROW BY PIVOT ELEMENT
C
330    A(ICOLUM,ICOLUM)=   CMPLX(1.0,0.0)
340    DO 350 L=1,N
350    A(ICOLUM,L)=A(ICOLUM,L)/PIVOT(I)
355    IF(M)380,380,360
360    DO 370 L=1,M
370    B(ICOLUM,L)=B(ICOLUM,L)/PIVOT(I)
C
C      REDUCE NON-PIVOT ROWS
C
380    DO 550 L1=1,N
390    IF(L1-ICOLUM)400,550,400
400    T=A(L1,ICOLUM)
420    A(L1,ICOLUM)=   CMPLX(0.0,0.0)
430    DO 450 L=1,N
450    A(L1,L)=A(L1,L)-A(ICOLUM,L)*T
455    IF(M)550,550,460
460    DO 500 L=1,M
500    B(L1,L)=B(L1,L)-B(ICOLUM,L)*T
550    CONTINUE
C
C      INTERCHANGE COLUMNS
C
600    DO 710 I=1,N
610    L=N+1-I
620    IF(INDEX(L,1)-INDEX(L,2))630,710,630
630    JROW=INDEX(L,1)
640    JCOLUM=INDEX(L,2)
650    DO 705 K=1,N
660    SWAP=A(K,JROW)
670    A(K,JROW)=A(K,JCOLUM)
700    A(K,JCOLUM)=SWAP
705    CONTINUE
710    CONTINUE
740    RETURN
       END
```

```
C        SUBROUTINE GMADD
C
C        PURPOSE
C           ADD TWO GENERAL MATRICES TO FORM RESULTANT GENERAL MATRIX
C
C        USAGE
C           CALL GMADD(A,B,R,N,M,AOS)
C
C        DESCRIPTION OF PARAMETERS
C           A - NAME OF FIRST INPUT MATRIX
C           B - NAME OF SECOND INPUT MATRIX
C           R - NAME OF OUTPUT MATRIX
C           N - NUMBER OF ROWS IN A,B,R
C           M - NUMBER OF COLUMNS IN A,B,R
C
C        REMARKS
C           ALL MATRICES MUST BE STORED AS GENERAL MATRICES
C
C        SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
C           NONE
C
C        METHOD
C           ADDITION IS PERFORMED ELEMENT BY ELEMENT
C
C     ..................................................................
C
      SUBROUTINE GMADD(A,B,R,N,M,AOS)
      COMPLEX A(1),B(1),R(1)
C
C        CALCULATE NUMBER OF ELEMENTS
C

      NM=N*M
C
C        ADD MATRICES
C
      DO 10 I=1,NM
10    R(I)=A(I)+AOS*B(I)
      RETURN
      END
```

```
C        SUBROUTINE MPROD
C
C        PURPOSE
C           MULTIPLY TWO GENERAL MATRICES TO FORM A RESULTANT GENERAL
C           MATRIX
C
C        USAGE
C           CALL MPROD(A,B,R,N,M,L)
C
C        DESCRIPTION OF PARAMETERS
C           A - NAME OF FIRST INPUT MATRIX
C           B - NAME OF SECOND INPUT MATRIX
C           R - NAME OF OUTPUT MATRIX
C           N - NUMBER OF ROWS IN A
C           M - NUMBER OF COLUMNS IN A AND ROWS IN B
C           L - NUMBER OF COLUMNS IN B
C
C        REMARKS
C           ALL MATRICES MUST BE STORED AS GENERAL MATRICES
C           MATRIX R CANNOT BE IN THE SAME LOCATION AS MATRIX A
C           MATRIX R CANNOT BE IN THE SAME LOCATION AS MATRIX B
C           NUMBER OF COLUMNS OF MATRIX A MUST BE EQUAL TO NUMBER OF ROW
C           OF MATRIX B
C
C        SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
C
C           NONE
C
C        METHOD
C           THE M BY L MATRIX B IS PREMULTIPLIED BY THE N BY M MATRIX A
C           AND THE RESULT IS STORED IN THE N BY L MATRIX R.
C
C     ..................................................................
C
      SUBROUTINE MPROD(A,B,R,N,M,L)
      COMPLEX A(1),B(1),R(1)
C
      IR=0
      IK=-M
      DO 10 K=1,L
      IK=IK+M
      DO 10 J=1,N
      IR=IR+1
      JI=J-N
      IB=IK
      R(IR)=(0.0,0.0)
      DO 10 I=1,M
      JI=JI+N
      IB=IB+1
   10 R(IR)=R(IR)+A(JI)*B(IB)
      RETURN
      END
```

APPENDIX II

$X_T - n\delta x = x$	x^2		$1x^3$		$x^4 + 3x1$	
.200000E+01	.400000E+01	0.	0.	.800000E+01	.160000E+02	.600000E+01
.199000E+01	.396010E+01	0.	0.	.788060E+01	.156824E+02	.597000E+01
.198000E+01	.392040E+01	0.	0.	.776239E+01	.153695E+02	.594000E+01
.197000E+01	.388090E+01	0.	0.	.764537E+01	.150614E+02	.591000E+01
.196000E+01	.384160E+01	0.	0.	.752954E+01	.147579E+02	.588000E+01
.195000E+01	.380250E+01	0.	0.	.741487E+01	.144590E+02	.585000E+01
.194000E+01	.376360E+01	0.	0.	.730138E+01	.141647E+02	.582000E+01
.193000E+01	.372490E+01	0.	0.	.718906E+01	.138749E+02	.579000E+01
.192000E+01	.368640E+01	0.	0.	.707789E+01	.135895E+02	.576000E+01
.191000E+01	.364810E+01	0.	0.	.696787E+01	.133086E+02	.573000E+01
.190000E+01	.361000E+01	0.	0.	.685900E+01	.130321E+02	.570000E+01
.189000E+01	.357210E+01	0.	0.	.675127E+01	.127599E+02	.567000E+01
.188000E+01	.353440E+01	0.	0.	.664467E+01	.124920E+02	.564000E+01
.187000E+01	.349690E+01	0.	0.	.653920E+01	.122283E+02	.561000E+01
.186000E+01	.345960E+01	0.	0.	.643486E+01	.119688E+02	.558000E+01
.185000E+01	.342250E+01	0.	0.	.633162E+01	.117135E+02	.555000E+01
.184000E+01	.338560E+01	0.	0.	.622950E+01	.114623E+02	.552000E+01
.183000E+01	.334890E+01	0.	0.	.612849E+01	.112151E+02	.549000E+01
.182000E+01	.331240E+01	0.	0.	.602857E+01	.109720E+02	.546000E+01
.181000E+01	.327610E+01	0.	0.	.592974E+01	.107328E+02	.543000E+01
.180000E+01	.324000E+01	0.	0.	.583200E+01	.104976E+02	.540000E+01
.179000E+01	.320410E+01	0.	0.	.573534E+01	.102663E+02	.537000E+01
.178000E+01	.316840E+01	0.	0.	.563975E+01	.100388E+02	.534000E+01
.177000E+01	.313290E+01	0.	0.	.554523E+01	.981506E+01	.531000E+01
.176000E+01	.309760E+01	0.	0.	.545178E+01	.959513E+01	.528000E+01
.175000E+01	.306250E+01	0.	0.	.535937E+01	.937891E+01	.525000E+01
.174000E+01	.302760E+01	0.	0.	.526802E+01	.916636E+01	.522000E+01
.173000E+01	.299290E+01	0.	0.	.517772E+01	.895745E+01	.519000E+01
.172000E+01	.295840E+01	0.	0.	.508845E+01	.875213E+01	.516000E+01
.171000E+01	.292410E+01	0.	0.	.500021E+01	.855036E+01	.513000E+01
.170000E+01	.289000E+01	0.	0.	.491300E+01	.835210E+01	.510000E+01
.169000E+01	.285610E+01	0.	0.	.482681E+01	.815731E+01	.507000E+01
.168000E+01	.282240E+01	0.	0.	.474163E+01	.796594E+01	.504000E+01
.167000E+01	.278890E+01	0.	0.	.465746E+01	.777736E+01	.501000E+01
.166000E+01	.275560E+01	0.	0.	.457430E+01	.759333E+01	.498000E+01
.165000E+01	.272250E+01	0.	0.	.449212E+01	.741201E+01	.495000E+01
.164000E+01	.268960E+01	0.	0.	.441094E+01	.723395E+01	.492000E+01
.163000E+01	.265690E+01	0.	0.	.433075E+01	.705912E+01	.489000E+01
.162000E+01	.262440E+01	0.	0.	.425153E+01	.688748E+01	.486000E+01
.161000E+01	.259210E+01	0.	0.	.417328E+01	.671898E+01	.483000E+01
.160000E+01	.256000E+01	0.	0.	.409600E+01	.655360E+01	.480000E+01
.159000E+01	.252810E+01	0.	0.	.401968E+01	.639128E+01	.477000E+01

.158000E+01	.249640E+01	0.	0.	.394431E+01	.623201E+01	.474000E+01
.157000E+01	.246490E+01	0.	0.	.385939E+01	.607573E+01	.471000E+01
.156000E+01	.243360E+01	0.	0.	.379642E+01	.592241E+01	.468000E+01
.155000E+01	.240250E+01	0.	0.	.372387E+01	.577201E+01	.465000E+01
.154000E+01	.237160E+01	0.	0.	.365225E+01	.562449E+01	.462000E+01
.153000E+01	.234090E+01	0.	0.	.358153E+01	.547581E+01	.459000E+01
.152000E+01	.231040E+01	0.	0.	.351181E+01	.533795E+01	.456000E+01
.151000E+01	.228010E+01	0.	0.	.344295E+01	.519886E+01	.453000E+01
.150000E+01	.225000E+01	0.	0.	.337500E+01	.506250E+01	.450000E+01
.149000E+01	.222010E+01	0.	0.	.330795E+01	.492884E+01	.447000E+01
.148000E+01	.219040E+01	0.	0.	.324179E+01	.479785E+01	.444000E+01
.147000E+01	.216090E+01	0.	0.	.317652E+01	.466949E+01	.441000E+01
.146000E+01	.213160E+01	0.	0.	.311214E+01	.454372E+01	.438000E+01
.145000E+01	.210250E+01	0.	0.	.304862E+01	.442051E+01	.435000E+01
.144000E+01	.207360E+01	0.	0.	.298598E+01	.429932E+01	.432000E+01
.143000E+01	.204490E+01	0.	0.	.292421E+01	.418152E+01	.429000E+01
.142000E+01	.201640E+01	0.	0.	.286329E+01	.406587E+01	.426000E+01
.141000E+01	.198810E+01	0.	0.	.280322E+01	.395254E+01	.423000E+01
.140000E+01	.196000E+01	0.	0.	.274400E+01	.384150E+01	.420000E+01
.139000E+01	.193210E+01	0.	0.	.268562E+01	.373301E+01	.417000E+01
.138000E+01	.190440E+01	0.	0.	.262807E+01	.362674E+01	.414000E+01
.137000E+01	.187690E+01	0.	0.	.257135E+01	.352275E+01	.411000E+01
.136000E+01	.184960E+01	0.	0.	.251546E+01	.342102E+01	.408000E+01
.135000E+01	.182250E+01	0.	0.	.246037E+01	.332151E+01	.405000E+01
.134000E+01	.179560E+01	0.	0.	.240610E+01	.322418E+01	.402000E+01
.133000E+01	.176890E+01	0.	0.	.235264E+01	.312901E+01	.399000E+01
.132000E+01	.174240E+01	0.	0.	.229997E+01	.303596E+01	.396000E+01
.131000E+01	.171610E+01	0.	0.	.224809E+01	.294509E+01	.393000E+01
.130000E+01	.169000E+01	0.	0.	.219700E+01	.285610E+01	.390000E+01
.129000E+01	.166410E+01	0.	0.	.214669E+01	.276923E+01	.387000E+01
.128000E+01	.163840E+01	0.	0.	.209715E+01	.268435E+01	.384000E+01
.127000E+01	.161290E+01	0.	0.	.204838E+01	.260145E+01	.381000E+01
.126000E+01	.158760E+01	0.	0.	.200038E+01	.252047E+01	.378000E+01
.125000E+01	.156250E+01	0.	0.	.195312E+01	.244141E+01	.375000E+01
.124000E+01	.153760E+01	0.	0.	.190662E+01	.236421E+01	.372000E+01
.123000E+01	.151290E+01	0.	0.	.186087E+01	.228887E+01	.369000E+01
.122000E+01	.148840E+01	0.	0.	.181585E+01	.221533E+01	.366000E+01
.121000E+01	.146410E+01	0.	0.	.177156E+01	.214358E+01	.363000E+01
.120000E+01	.144000E+01	0.	0.	.172800E+01	.207360E+01	.360000E+01
.119000E+01	.141610E+01	0.	0.	.168516E+01	.200534E+01	.357000E+01
.118000E+01	.139240E+01	0.	0.	.164303E+01	.193878E+01	.354000E+01
.117000E+01	.136890E+01	0.	0.	.160161E+01	.187389E+01	.351000E+01

.116000E+01	.134560E+01	0.	0.	.156090E+01	.181064E+01	.348000E+01
.115000E+01	.132250E+01	0.	0.	.152087E+01	.174901E+01	.345000E+01
.114000E+01	.129960E+01	0.	0.	.148154E+01	.168896E+01	.342000E+01
.113000E+01	.127690E+01	0.	0.	.144290E+01	.163047E+01	.339000E+01
.112000E+01	.125440E+01	0.	0.	.140493E+01	.157352E+01	.336000E+01
.111000E+01	.123210E+01	0.	0.	.136763E+01	.151807E+01	.333000E+01
.110000E+01	.121000E+01	0.	0.	.133100E+01	.146410E+01	.330000E+01
.109000E+01	.118810E+01	0.	0.	.129503E+01	.141158E+01	.327000E+01
.108000E+01	.116640E+01	0.	0.	.125971E+01	.136049E+01	.324000E+01
.107000E+01	.114490E+01	0.	0.	.122504E+01	.131080E+01	.321000E+01
.106000E+01	.112360E+01	0.	0.	.119102E+01	.126248E+01	.318000E+01
.105000E+01	.110250E+01	0.	0.	.115762E+01	.121551E+01	.315000E+01
.104000E+01	.108160E+01	0.	0.	.112486E+01	.116986E+01	.312000E+01
.103000E+01	.106090E+01	0.	0.	.109273E+01	.112551E+01	.309000E+01
.102000E+01	.104040E+01	0.	0.	.106121E+01	.108243E+01	.306000E+01
.101000E+01	.102010E+01	0.	0.	.103030E+01	.104060E+01	.303000E+01
.100000E+01	.100000E+01	0.	0.	.100000E+01	.100000E+01	.300000E+01
.990000E+00	.980100E+00	0.	0.	.970299E+00	.960596E+00	.297000E+01
.980000E+00	.960400E+00	0.	0.	.941192E+00	.922368E+00	.294000E+01
.970000E+00	.940900E+00	0.	0.	.912673E+00	.885293E+00	.291000E+01
.960000E+00	.921600E+00	0.	0.	.884736E+00	.849347E+00	.288000E+01
.950000E+00	.902500E+00	0.	0.	.857375E+00	.814506E+00	.285000E+01
.940000E+00	.883600E+00	0.	0.	.830584E+00	.780749E+00	.282000E+01
.930000E+00	.864900E+00	0.	0.	.804357E+00	.748052E+00	.279000E+01
.920000E+00	.846400E+00	0.	0.	.778688E+00	.716393E+00	.276000E+01
.910000E+00	.828100E+00	0.	0.	.753571E+00	.685750E+00	.273000E+01
.900000E+00	.810000E+00	0.	0.	.729000E+00	.656100E+00	.270000E+01
.890000E+00	.792100E+00	0.	0.	.704969E+00	.627422E+00	.267000E+01
.880000E+00	.774400E+00	0.	0.	.681472E+00	.599695E+00	.264000E+01
.870000E+00	.756900E+00	0.	0.	.658503E+00	.572898E+00	.261000E+01
.860000E+00	.739600E+00	0.	0.	.636056E+00	.547008E+00	.258000E+01
.850000E+00	.722500E+00	0.	0.	.614125E+00	.522006E+00	.255000E+01
.840000E+00	.705600E+00	0.	0.	.592704E+00	.497871E+00	.252000E+01
.830000E+00	.688900E+00	0.	0.	.571787E+00	.474583E+00	.249000E+01
.820000E+00	.672400E+00	0.	0.	.551368E+00	.452122E+00	.246000E+01
.810000E+00	.656100E+00	0.	0.	.531441E+00	.430467E+00	.243000E+01
.800000E+00	.640000E+00	0.	0.	.512000E+00	.409600E+00	.240000E+01
.790000E+00	.624100E+00	0.	0.	.493039E+00	.389501E+00	.237000E+01
.780000E+00	.608400E+00	0.	0.	.474552E+00	.370151E+00	.234000E+01
.770000E+00	.592900E+00	0.	0.	.456533E+00	.351530E+00	.231000E+01
.760000E+00	.577600E+00	0.	0.	.438976E+00	.333622E+00	.228000E+01
.750000E+00	.562500E+00	0.	0.	.421875E+00	.316406E+00	.225000E+01

.740000E+00	.547600E+00	0.	0.	.405224E+00	.299866E+00	.222000E+01
.730000E+00	.532900E+00	0.	0.	.389017E+00	.283982E+00	.219000E+01
.720000E+00	.518400E+00	0.	0.	.373248E+00	.268739E+00	.216000E+01
.710000E+00	.504100E+00	0.	0.	.357911E+00	.254117E+00	.213000E+01
.700000E+00	.490000E+00	0.	0.	.343000E+00	.240100E+00	.210000E+01
.690000E+00	.476100E+00	0.	0.	.328509E+00	.226671E+00	.207000E+01
.680000E+00	.462400E+00	0.	0.	.314432E+00	.213814E+00	.204000E+01
.670000E+00	.448900E+00	0.	0.	.300763E+00	.201511E+00	.201000E+01
.660000E+00	.435600E+00	0.	0.	.287496E+00	.189747E+00	.198000E+01
.650000E+00	.422500E+00	0.	0.	.274625E+00	.178506E+00	.195000E+01
.640000E+00	.409600E+00	0.	0.	.262144E+00	.167772E+00	.192000E+01
.630000E+00	.396900E+00	0.	0.	.250047E+00	.157530E+00	.189000E+01
.620000E+00	.384400E+00	0.	0.	.238328E+00	.147763E+00	.186000E+01
.610000E+00	.372100E+00	0.	0.	.226981E+00	.138458E+00	.183000E+01
.600000E+00	.360000E+00	0.	0.	.216000E+00	.129600E+00	.180000E+01
.590000E+00	.348100E+00	0.	0.	.205379E+00	.121174E+00	.177000E+01
.580000E+00	.336400E+00	0.	0.	.195112E+00	.113165E+00	.174000E+01
.570000E+00	.324900E+00	0.	0.	.185193E+00	.105560E+00	.171000E+01
.560000E+00	.313600E+00	0.	0.	.175616E+00	.983450E-01	.168000E+01
.550000E+00	.302500E+00	0.	0.	.166375E+00	.915062E-01	.165000E+01
.540000E+00	.291600E+00	0.	0.	.157464E+00	.850306E-01	.162000E+01
.530000E+00	.280900E+00	0.	0.	.148877E+00	.789048E-01	.159000E+01
.520000E+00	.270400E+00	0.	0.	.140608E+00	.731162E-01	.156000E+01
.510000E+00	.260100E+00	0.	0.	.132651E+00	.676520E-01	.153000E+01
.500000E+00	.250000E+00	0.	0.	.125000E+00	.625000E-01	.150000E+01
.490000E+00	.240100E+00	0.	0.	.117649E+00	.576480E-01	.147000E+01
.480000E+00	.230400E+00	0.	0.	.110592E+00	.530842E-01	.144000E+01
.470000E+00	.220900E+00	0.	0.	.103823E+00	.487968E-01	.141000E+01
.460000E+00	.211600E+00	0.	0.	.973360E-01	.447746E-01	.138000E+01
.450000E+00	.202500E+00	0.	0.	.911250E-01	.410062E-01	.135000E+01
.440000E+00	.193600E+00	0.	0.	.851840E-01	.374810E-01	.132000E+01
.430000E+00	.184900E+00	0.	0.	.795070E-01	.341880E-01	.129000E+01
.420000E+00	.176400E+00	0.	0.	.740880E-01	.311170E-01	.126000E+01
.410000E+00	.168100E+00	0.	0.	.689210E-01	.282576E-01	.123000E+01
.400000E+00	.160000E+00	0.	0.	.640000E-01	.256000E-01	.120000E+01
.390000E+00	.152100E+00	0.	0.	.593190E-01	.231344E-01	.117000E+01
.380000E+00	.144400E+00	0.	0.	.548720E-01	.208514E-01	.114000E+01
.370000E+00	.136900E+00	0.	0.	.506530E-01	.187416E-01	.111000E+01
.360000E+00	.129600E+00	0.	0.	.466560E-01	.167962E-01	.108000E+01
.350000E+00	.122500E+00	0.	0.	.428750E-01	.150062E-01	.105000E+01
.340000E+00	.115600E+00	0.	0.	.393040E-01	.133634E-01	.102000E+01
.330000E+00	.108900E+00	0.	0.	.359370E-01	.118592E-01	.990000E+00

.320000E+00	.102400E+00	0.	0.	.327680E-01	.104858E-01	.960000E+00
.310000E+00	.961000E-01	0.	0.	.297910E-01	.923521E-02	.930000E+00
.300000E+00	.900000E-01	0.	0.	.270000E-01	.810000E-02	.900000E+00
.290000E+00	.841000E-01	0.	0.	.243890E-01	.707281E-02	.870000E+00
.280000E+00	.784000E-01	0.	0.	.219520E-01	.614656E-02	.840000E+00
.270000E+00	.729000E-01	0.	0.	.196830E-01	.531441E-02	.810000E+00
.260000E+00	.676000E-01	0.	0.	.175760E-01	.456976E-02	.780000E+00
.250000E+00	.625000E-01	0.	0.	.156250E-01	.390625E-02	.750000E+00
.240000E+00	.576000E-01	0.	0.	.138240E-01	.331776E-02	.720000E+00
.230000E+00	.529000E-01	0.	0.	.121670E-01	.279841E-02	.690000E+00
.220000E+00	.484000E-01	0.	0.	.106480E-01	.234256E-02	.660000E+00
.210000E+00	.441000E-01	0.	0.	.926100E-02	.194481E-02	.630000E+00
.200000E+00	.400000E-01	0.	0.	.800000E-02	.160000E-02	.600000E+00
.190000E+00	.361000E-01	0.	0.	.685900E-02	.130321E-02	.570000E+00
.180000E+00	.324000E-01	0.	0.	.583200E-02	.104976E-02	.540000E+00
.170000E+00	.289000E-01	0.	0.	.491300E-02	.835210E-03	.510000E+00
.160000E+00	.256000E-01	0.	0.	.409600E-02	.655360E-03	.480000E+00
.150000E+00	.225000E-01	0.	0.	.337500E-02	.506250E-03	.450000E+00
.140000E+00	.196000E-01	0.	0.	.274400E-02	.384160E-03	.420000E+00
.130000E+00	.169000E-01	0.	0.	.219700E-02	.285610E-03	.390000E+00
.120000E+00	.144000E-01	0.	0.	.172800E-02	.207360E-03	.360000E+00
.110000E+00	.121000E-01	0.	0.	.133100E-02	.146410E-03	.330000E+00
.100000E+00	.100000E-01	0.	0.	.100000E-02	.100000E-03	.300000E+00
.900000E-01	.810000E-02	0.	0.	.729000E-03	.656100E-04	.270000E+00
.800000E-01	.640000E-02	0.	0.	.512000E-03	.409600E-04	.240000E+00
.700000E-01	.490000E-02	0.	0.	.343000E-03	.240100E-04	.210000E+00
.600000E-01	.360000E-02	0.	0.	.216000E-03	.129600E-04	.180000E+00
.500000E-01	.250000E-02	0.	0.	.125000E-03	.625000E-05	.150000E+00
.400000E-01	.160000E-02	0.	0.	.640000E-04	.256000E-05	.120000E+00
.300000E-01	.900000E-03	0.	0.	.270000E-04	.810000E-06	.900000E-01
.200000E-01	.400000E-03	0.	0.	.800000E-05	.160000E-06	.600000E-01
.100000E-01	.100000E-03	0.	0.	.100000E-05	.100000E-07	.300000E-01
0.	0.	0.	0.	0.	0.	0.

APPENDIX III

x^2		$1x^3$		x^4+3x1	
.400000E+01	0.	-.104048E-03	.802780E+01	.160000E+02	.500000E+01
.396020E+01	-.475093E-05	-.106129E-03	.790835E+01	.156322E+02	.597000E+01
.392060E+01	-.952694E-05	-.108379E-03	.779010E+01	.153695E+02	.594000E+01
.388120E+01	-.144264E-04	-.110643E-03	.767394E+01	.150612E+02	.591000E+01
.384200E+01	-.193226E-04	-.113059E-03	.755716E+01	.147573E+02	.588000E+01
.380300E+01	-.242306E-04	-.115482E-03	.744245E+01	.144589E+02	.585000E+01
.376420E+01	-.291544E-04	-.118042E-03	.732892E+01	.141647E+02	.582000E+01
.372560E+01	-.340857E-04	-.120602E-03	.721654E+01	.138747E+02	.579000E+01
.368720E+01	-.390672E-04	-.123285E-03	.710533E+01	.135896E+02	.576000E+01
.364900E+01	-.440312E-04	-.125961E-03	.699527E+01	.133085E+02	.573000E+01
.361100E+01	-.490382E-04	-.128746E-03	.688635E+01	.130322E+02	.570000E+01
.357320E+01	-.540237E-04	-.131519E-03	.677857E+01	.127598E+02	.567000E+01
.353560E+01	-.590454E-04	-.134388E-03	.667192E+01	.124921E+02	.564000E+01
.349820E+01	-.640420E-04	-.137238E-03	.656641E+01	.122282E+02	.561000E+01
.346100E+01	-.690682E-04	-.140173E-03	.646201E+01	.119689E+02	.558000E+01
.342400E+01	-.740656E-04	-.143093E-03	.635873E+01	.117134E+02	.555000E+01
.338720E+01	-.790868E-04	-.146067E-03	.625656E+01	.114624E+02	.552000E+01
.335060E+01	-.840761E-04	-.149022E-03	.615549E+01	.112151E+02	.549000E+01
.331420E+01	-.890826E-04	-.152038E-03	.605552E+01	.109721E+02	.546000E+01
.327800E+01	-.940547E-04	-.155022E-03	.595664E+01	.107323E+02	.543000E+01
.324200E+01	-.990386E-04	-.158056E-03	.585885E+01	.104977E+02	.540000E+01
.320620E+01	-.103985E-03	-.161154E-03	.576213E+01	.102662E+02	.537000E+01
.317060E+01	-.108938E-03	-.164193E-03	.566649E+01	.100389E+02	.534000E+01
.313520E+01	-.113850E-03	-.167091E-03	.557192E+01	.981506E+01	.531000E+01
.310000E+01	-.118764E-03	-.170122E-03	.547841E+01	.959528E+01	.528000E+01
.306500E+01	-.123636E-03	-.173107E-03	.538595E+01	.937892E+01	.525000E+01
.303020E+01	-.128574E-03	-.176119E-03	.529455E+01	.916653E+01	.522000E+01
.299560E+01	-.133328E-03	-.179080E-03	.520418E+01	.895748E+01	.519000E+01
.296120E+01	-.138143E-03	-.182058E-03	.511486E+01	.875232E+01	.516000E+01
.292700E+01	-.142912E-03	-.184986E-03	.502656E+01	.855041E+01	.513000E+01
.289300E+01	-.147669E-03	-.187922E-03	.493929E+01	.835230E+01	.510000E+01
.285920E+01	-.152377E-03	-.190894E-03	.485305E+01	.815737E+01	.507000E+01
.282560E+01	-.157070E-03	-.193690E-03	.476781E+01	.796616E+01	.504000E+01
.279220E+01	-.161712E-03	-.196518E-03	.468358E+01	.777804E+01	.501000E+01
.275900E+01	-.166375E-03	-.199742E-03	.460035E+01	.759356E+01	.498000E+01
.272600E+01	-.170995E-03	-.202108E-03	.451812E+01	.741211E+01	.495000E+01
.269320E+01	-.175453E-03	-.204864E-03	.443688E+01	.723419E+01	.492000E+01
.266060E+01	-.179046E-03	-.207556E-03	.435662E+01	.705923E+01	.489000E+01
.262820E+01	-.184415E-03	-.210239E-03	.427734E+01	.688774E+01	.486000E+01
.259600E+01	-.188928E-03	-.212856E-03	.419903E+01	.671912E+01	.483000E+01
.256400E+01	-.193213E-03	-.215453E-03	.412168E+01	.655388E+01	.480000E+01
.253220E+01	-.197541E-03	-.217[illegible]6E-03	.404530E+01	.639144E+01	.477000E+01

.250060E+01	-.201838E-03	-.220495E-03	.396986E+01	.623230E+01	.474000E+01
.246920E+01	-.206078E-03	-.222937E-03	.389538E+01	.607590E+01	.471000E+01
.243800E+01	-.210285E-03	-.225352E-03	.382184E+01	.592272E+01	.468000E+01
.240700E+01	-.214433E-03	-.227699E-03	.374923E+01	.577220E+01	.465000E+01
.237620E+01	-.218545E-03	-.230014E-03	.367755E+01	.562481E+01	.462000E+01
.234560E+01	-.222598E-03	-.232261E-03	.360679E+01	.548002E+01	.459000E+01
.231520E+01	-.226614E-03	-.234473E-03	.353695E+01	.533829E+01	.456000E+01
.228500E+01	-.230570E-03	-.236616E-03	.346803E+01	.519908E+01	.453000E+01
.225500E+01	-.234486E-03	-.238721E-03	.340001E+01	.506286E+01	.450000E+01
.222520E+01	-.238343E-03	-.240755E-03	.333288E+01	.492909E+01	.447000E+01
.219560E+01	-.242158E-03	-.242749E-03	.326665E+01	.479823E+01	.444000E+01
.216620E+01	-.245913E-03	-.244673E-03	.320131E+01	.466976E+01	.441000E+01
.213700E+01	-.249625E-03	-.246553E-03	.313685E+01	.454411E+01	.438000E+01
.210800E+01	-.253276E-03	-.248363E-03	.307326E+01	.442079E+01	.435000E+01
.207920E+01	-.256884E-03	-.250128E-03	.301055E+01	.430023E+01	.432000E+01
.205060E+01	-.260430E-03	-.251822E-03	.294870E+01	.418192E+01	.429000E+01
.202220E+01	-.263932E-03	-.253469E-03	.288770E+01	.406630E+01	.426000E+01
.199400E+01	-.267373E-03	-.255045E-03	.282755E+01	.395287E+01	.423000E+01
.196600E+01	-.270768E-03	-.256572E-03	.276826E+01	.384204E+01	.420000E+01
.193820E+01	-.274103E-03	-.258029E-03	.270980E+01	.373336E+01	.417000E+01
.191060E+01	-.277390E-03	-.259435E-03	.265217E+01	.362720E+01	.414000E+01
.188320E+01	-.280617E-03	-.260772E-03	.259537E+01	.352312E+01	.411000E+01
.185600E+01	-.283797E-03	-.262057E-03	.253939E+01	.342150E+01	.408000E+01
.182900E+01	-.286917E-03	-.263272E-03	.248423E+01	.332189E+01	.405000E+01
.180220E+01	-.289989E-03	-.264435E-03	.242987E+01	.322468E+01	.402000E+01
.177560E+01	-.293001E-03	-.265529E-03	.237632E+01	.312941E+01	.399000E+01
.174920E+01	-.295964E-03	-.266570E-03	.232357E+01	.303648E+01	.396000E+01
.172300E+01	-.298869E-03	-.267542E-03	.227160E+01	.294543E+01	.393000E+01
.169700E+01	-.301725E-03	-.268461E-03	.222043E+01	.285664E+01	.390000E+01
.167120E+01	-.304522E-03	-.269311E-03	.217003E+01	.276968E+01	.387000E+01
.164560E+01	-.307271E-03	-.270108E-03	.212040E+01	.268491E+01	.384000E+01
.162020E+01	-.309962E-03	-.270838E-03	.207154E+01	.260192E+01	.381000E+01
.159500E+01	-.312605E-03	-.271513E-03	.202345E+01	.252105E+01	.378000E+01
.157000E+01	-.315189E-03	-.272123E-03	.197610E+01	.244190E+01	.375000E+01
.154520E+01	-.317726E-03	-.272678E-03	.192951E+01	.236481E+01	.372000E+01
.152060E+01	-.320206E-03	-.273168E-03	.188366E+01	.228938E+01	.369000E+01
.149620E+01	-.322638E-03	-.273603E-03	.183855E+01	.221595E+01	.366000E+01
.147200E+01	-.325015E-03	-.273975E-03	.179416E+01	.214413E+01	.363000E+01
.144800E+01	-.327343E-03	-.274292E-03	.175051E+01	.207424E+01	.360000E+01
.142420E+01	-.329617E-03	-.274547E-03	.170757E+01	.200590E+01	.357000E+01
.140060E+01	-.331844E-03	-.274747E-03	.166534E+01	.193943E+01	.354000E+01
.137720E+01	-.334017E-03	-.274886E-03	.162383E+01	.187447E+01	.351000E+01

.135400E+01	-.336143E-03	-.274971E-03	.158301E+01	.181132E+01	.348000E+01
.133100E+01	-.338216E-03	-.274996E-03	.154269E+01	.174961E+01	.345000E+01
.130820E+01	-.340243E-03	-.274967E-03	.150345E+01	.168966E+01	.342000E+01
.128560E+01	-.342219E-03	-.274880E-03	.146470E+01	.163110E+01	.339000E+01
.126320E+01	-.344149E-03	-.274739E-03	.142663E+01	.157424E+01	.336000E+01
.124100E+01	-.346029E-03	-.274541E-03	.138923E+01	.151872E+01	.333000E+01
.121900E+01	-.347864E-03	-.274290E-03	.135249E+01	.146484E+01	.330000E+01
.119720E+01	-.349650E-03	-.273983E-03	.131641E+01	.141226E+01	.327000E+01
.117560E+01	-.351392E-03	-.273625E-03	.128099E+01	.136125E+01	.324000E+01
.115420E+01	-.353086E-03	-.273210E-03	.124621E+01	.131149E+01	.321000E+01
.113300E+01	-.354737E-03	-.272746E-03	.121207E+01	.126326E+01	.318000E+01
.111200E+01	-.356341E-03	-.272227E-03	.117857E+01	.121623E+01	.315000E+01
.109120E+01	-.357904E-03	-.271659E-03	.114570E+01	.117067E+01	.312000E+01
.107060E+01	-.359421E-03	-.271037E-03	.111344E+01	.112626E+01	.309000E+01
.105020E+01	-.360897E-03	-.270367E-03	.108181E+01	.108327E+01	.306000E+01
.103000E+01	-.362329E-03	-.269644E-03	.105079E+01	.104138E+01	.303000E+01
.101000E+01	-.363721E-03	-.268875E-03	.102037E+01	.100086E+01	.300000E+01
.990200E+00	-.365070E-03	-.268054E-03	.990548E+00	.961393E+00	.297000E+01
.970600E+00	-.366381E-03	-.267186E-03	.961322E+00	.923249E+00	.294000E+01
.951200E+00	-.367650E-03	-.266270E-03	.932681E+00	.886115E+00	.291000E+01
.932000E+00	-.368882E-03	-.265307E-03	.904622E+00	.850251E+00	.288000E+01
.913000E+00	-.370073E-03	-.264296E-03	.877137E+00	.815355E+00	.285000E+01
.894200E+00	-.371228E-03	-.263240E-03	.850222E+00	.781678E+00	.282000E+01
.875600E+00	-.372345E-03	-.262137E-03	.823868E+00	.748926E+00	.279000E+01
.857200E+00	-.373427E-03	-.260990E-03	.798072E+00	.717347E+00	.276000E+01
.839000E+00	-.374471E-03	-.259797E-03	.772826E+00	.686650E+00	.273000E+01
.821000E+00	-.375481E-03	-.258561E-03	.748125E+00	.657080E+00	.270000E+01
.803200E+00	-.376456E-03	-.257231E-03	.723963E+00	.628350E+00	.267000E+01
.785600E+00	-.377398E-03	-.255958E-03	.700333E+00	.600701E+00	.264000E+01
.768200E+00	-.378306E-03	-.254592E-03	.677230E+00	.573852E+00	.261000E+01
.751000E+00	-.379182E-03	-.253184E-03	.654646E+00	.548039E+00	.258000E+01
.734000E+00	-.380026E-03	-.251735E-03	.632580E+00	.522989E+00	.255000E+01
.717200E+00	-.380839E-03	-.250244E-03	.611021E+00	.498929E+00	.252000E+01
.700600E+00	-.381621E-03	-.248712E-03	.589965E+00	.475593E+00	.249000E+01
.684200E+00	-.382374E-03	-.247141E-03	.569405E+00	.453206E+00	.246000E+01
.668000E+00	-.383097E-03	-.245530E-03	.549336E+00	.431506E+00	.243000E+01
.652000E+00	-.383793E-03	-.243879E-03	.529751E+00	.410712E+00	.240000E+01
.636200E+00	-.384460E-03	-.242189E-03	.510645E+00	.390568E+00	.237000E+01
.620600E+00	-.385101E-03	-.240462E-03	.492011E+00	.371290E+00	.234000E+01
.605200E+00	-.385715E-03	-.238696E-03	.473844E+00	.352627E+00	.231000E+01
.590000E+00	-.386303E-03	-.236892E-03	.456137E+00	.334789E+00	.228000E+01
.575000E+00	-.386867E-03	-.235051E-03	.438885E+00	.317532E+00	.225000E+01

34

.560200E+00	-.387406E-03	-.233174E-03	.422081E+00	.301062E+00	.222000E+01
.545600E+00	-.387921E-03	-.231259E-03	.405720E+00	.285138E+00	.219000E+01
.531200E+00	-.388414E-03	-.229309E-03	.389795E+00	.269964E+00	.216000E+01
.517000E+00	-.388884E-03	-.227323E-03	.374301E+00	.255302E+00	.213000E+01
.503000E+00	-.389332E-03	-.225302E-03	.359231E+00	.241354E+00	.210000E+01
.489200E+00	-.389760E-03	-.223245E-03	.344579E+00	.227668E+00	.207000E+01
.475600E+00	-.390167E-03	-.221154E-03	.330340E+00	.215098E+00	.204000E+01
.462200E+00	-.390554E-03	-.219028E-03	.316507E+00	.202759E+00	.201000E+01
.449000E+00	-.390922E-03	-.216868E-03	.303074E+00	.191062E+00	.198000E+01
.436000E+00	-.391271E-03	-.214673E-03	.290036E+00	.179785E+00	.195000E+01
.423200E+00	-.391603E-03	-.212446E-03	.277386E+00	.169118E+00	.192000E+01
.410600E+00	-.391917E-03	-.210184E-03	.265119E+00	.158841E+00	.189000E+01
.398200E+00	-.392215E-03	-.207889E-03	.253227E+00	.149140E+00	.186000E+01
.386000E+00	-.392496E-03	-.205561E-03	.241706E+00	.139802E+00	.183000E+01
.374000E+00	-.392762E-03	-.203201E-03	.230550E+00	.131008E+00	.180000E+01
.362200E+00	-.393013E-03	-.200807E-03	.219751E+00	.122550E+00	.177000E+01
.350600E+00	-.393250E-03	-.198381E-03	.209305E+00	.114606E+00	.174000E+01
.339200E+00	-.393472E-03	-.195922E-03	.199204E+00	.106970E+00	.171000E+01
.328000E+00	-.393682E-03	-.193432E-03	.189444E+00	.998183E-01	.168000E+01
.317000E+00	-.393879E-03	-.190908E-03	.180018E+00	.929502E-01	.165000E+01
.306200E+00	-.394063E-03	-.188353E-03	.170921E+00	.865372E-01	.162000E+01
.295600E+00	-.394236E-03	-.185766E-03	.162145E+00	.803832E-01	.159000E+01
.285200E+00	-.394398E-03	-.183147E-03	.153686E+00	.746566E-01	.156000E+01
.275000E+00	-.394549E-03	-.180496E-03	.145536E+00	.691653E-01	.153000E+01
.265000E+00	-.394690E-03	-.177813E-03	.137691E+00	.640748E-01	.150000E+01
.255200E+00	-.394821E-03	-.175098E-03	.130143E+00	.591968E-01	.147000E+01
.245600E+00	-.394943E-03	-.172352E-03	.122888E+00	.546939E-01	.144000E+01
.236200E+00	-.395056E-03	-.169573E-03	.115919E+00	.503817E-01	.141000E+01
.227000E+00	-.395161E-03	-.166763E-03	.109229E+00	.464197E-01	.138000E+01
.218000E+00	-.395258E-03	-.163921E-03	.102814E+00	.426277E-01	.135000E+01
.209200E+00	-.395347E-03	-.161046E-03	.966662E-01	.391621E-01	.132000E+01
.200600E+00	-.395429E-03	-.158140E-03	.907806E-01	.358466E-01	.129000E+01
.192200E+00	-.395505E-03	-.155202E-03	.851509E-01	.328347E-01	.126000E+01
.184000E+00	-.395574E-03	-.152232E-03	.797711E-01	.299539E-01	.123000E+01
.176000E+00	-.395638E-03	-.149229E-03	.746351E-01	.273550E-01	.120000E+01
.168200E+00	-.395696E-03	-.146194E-03	.697370E-01	.248690E-01	.117000E+01
.160600E+00	-.395748E-03	-.143126E-03	.650706E-01	.226442E-01	.114000E+01
.153200E+00	-.395796E-03	-.140026E-03	.606301E-01	.205151E-01	.111000E+01
.146000E+00	-.395840E-03	-.136892E-03	.564093E-01	.186274E-01	.108000E+01
.139000E+00	-.395879E-03	-.133726E-03	.524023E-01	.168192E-01	.105000E+01
.132200E+00	-.395914E-03	-.130527E-03	.486030E-01	.152337E-01	.102000E+01
.125600E+00	-.395945E-03	-.127294E-03	.450053E-01	.137123E-01	.990000E+00

.119200E+00	-.395973E-03	-.124027E-03	.416034E-01	.123958E-01	.960000E+00
.113000E+00	-.395998E-03	-.120727E-03	.383911E-01	.111291E-01	.930000E+00
.107000E+00	-.396021E-03	-.117393E-03	.353624E-01	.100504E-01	.900000E+00
.101200E+00	-.396040E-03	-.114024E-03	.325113E-01	.900810E-02	.870000E+00
.956000E-01	-.396057E-03	-.110621E-03	.298318E-01	.813794E-02	.840000E+00
.902000E-01	-.396072E-03	-.107183E-03	.273178E-01	.729177E-02	.810000E+00
.850000E-01	-.396086E-03	-.103710E-03	.249634E-01	.660285E-02	.780000E+00
.800000E-01	-.396097E-03	-.100202E-03	.227625E-01	.592635E-02	.750000E+00
.752000E-01	-.396107E-03	-.966575E-04	.207090E-01	.533325E-02	.720000E+00
.706000E-01	-.396115E-03	-.930774E-04	.187971E-01	.486194E-02	.690000E+00
.662000E-01	-.396122E-03	-.894611E-04	.170205E-01	.446116E-02	.660000E+00
.620000E-01	-.396128E-03	-.858082E-04	.153733E-01	.405247E-02	.630000E+00
.580000E-01	-.396133E-03	-.821183E-04	.138495E-01	.376243E-02	.600000E+00
.542000E-01	-.396137E-03	-.783912E-04	.124431E-01	.345572E-02	.570000E+00
.506000E-01	-.396140E-03	-.746265E-04	.111430E-01	.325676E-02	.540000E+00
.472000E-01	-.396143E-03	-.708239E-04	.995818E-02	.303330E-02	.510000E+00
.440000E-01	-.396145E-03	-.669829E-04	.886763E-02	.290769E-02	.480000E+00
.410000E-01	-.396146E-03	-.631032E-04	.787032E-02	.275067E-02	.450000E+00
.382000E-01	-.396148E-03	-.591846E-04	.696022E-02	.268257E-02	.420000E+00
.356000E-01	-.396149E-03	-.552264E-04	.613130E-02	.257711E-02	.390000E+00
.332000E-01	-.396149E-03	-.512285E-04	.537755E-02	.252264E-02	.360000E+00
.310000E-01	-.396150E-03	-.471904E-04	.469292E-02	.248578E-02	.330000E+00
.290000E-01	-.396150E-03	-.431116E-04	.407139E-02	.249295E-02	.300000E+00
.272000E-01	-.396151E-03	-.389919E-04	.350693E-02	.245364E-02	.270000E+00
.256000E-01	-.396151E-03	-.348307E-04	.299352E-02	.248239E-02	.240000E+00
.242000E-01	-.396151E-03	-.306277E-04	.252511E-02	.246151E-02	.210000E+00
.230000E-01	-.396151E-03	-.263825E-04	.209568E-02	.250370E-02	.180000E+00
.220000E-01	-.396151E-03	-.220946E-04	.169921E-02	.249404E-02	.150000E+00
.212000E-01	-.396151E-03	-.177636E-04	.132965E-02	.254346E-02	.120000E+00
.206000E-01	-.396151E-03	-.133891E-04	.980982E-03	.253974E-02	.900000E-01
.202000E-01	-.396151E-03	-.897063E-05	.647173E-03	.259208E-02	.600000E-01
.200000E-01	-.396151E-03	-.450774E-05	.322189E-03	.259094E-02	.300000E-01
.200000E-01	-.396151E-03	0.	0.	.264382E-02	-.516052E-11